

Project No.:18005 Core Institution in Japan:Hiroshima University
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**JSPS Core-to-Core Program -Strategic Research Networks-  
FY2008 Research Report**

Project No.	18005
Research Theme	New Developments of Arithmetic Geometry, Motive, Galois Theory, and Their Practical Applications
Duration of Project	from April 1, 2008 to March 31, 2011
Core Institution in Japan	Hiroshima University

**Implementing Organizations**

Country	Japan
Core Institution	Hiroshima University
Co-Chair (name and title)	Makoto Matsumoto: Professor
Number of Cooperating Institutions	4
Cooperating Institutions	University of Tokyo, Kyoto University, Nagoya University, Tohoku University

Country	United States of America
Core Institution	Duke University
Co-Chair (name and title)	Richard Hain: Professor
Number of Cooperating Institutions	0
Cooperating Institutions	None
Matching Fund	National Science Foundation "Topology and Algebra and Number Theory, the Division of Mathematical Sciences of the NSF"

Country	Italy
Core Institution	Padova University
Co-Chair (name and title)	Bruno Chiarellotto: Professor
Number of Cooperating Institutions	0
Cooperating Institutions	None
Matching Fund	Ministero dell' Universita' e della Ricerca (MUR) " Programmi di ricerca scientifica di rilevante interesse nazionale, PRIN"

Country	France
Core Institution	Universite Paris 11 Orsay
Co-Chair (name and title)	Jean-Marc Fontaine: Professor
Number of Cooperating Institutions	3
Cooperating Institutions	Universite de Rennes, ENS, Universite Paris 13
Matching Fund	Agence Nationale de la Recherche "REP GAL AUT"

Country	Canada
Core Institution	University of Montreal
Co-Chair (name and title)	Pierre L'Ecuyer: Professor
Number of Cooperating Institutions	0
Cooperating Institutions	None
Matching Fund	Natural Sciences and Engineering Research Council of Canada "Discovery Grants (Individual, Group and Subatomic Physics [SAP] Project)" Canadian Government via Prof. L'Ecuyer's Canada Research Chair on "stochastic simulation and optimization"

### Result of Program Implementation

#### Scientific Results:

##### Pure Mathematics:

R. Hain at Duke Univ. and M. Matsumoto at Hiroshima Univ. wrote a paper on the relative pro- $l$  mapping class group and Galois action over  $\mathbb{Q}$ . The paper is accepted in Journal of Algebra. These two, Terasoma and Pearlstein are writing a paper on Variation of Mixed Hodge Structure.

B. Chiarellotto at Padova Univ. and N. Tsuzuki at Tohoku Univ. wrote a paper on "Dwork's problem" on the  $p$ -adic logarithmic growth, and the paper is accepted by J. Inst. Math. Jussieu.

D. Caro at Universite de Caen and N. Tsuzuki studied maximal overconvergent sheaves in the category of the arithmetic  $D$ -modules, and the result is submitted.

##### Pragmatic result:

M. Matsumoto and H. Haramoto at Hiroshima Univ, and P. L'Ecuyer at Montreal Univ. developed a fast practical algorithm for jumping ahead for F2-linear random number generator based on Karatsuba polynomial multiplication. The result appeared in LNCS (Springer).

M. Saito and M. Matsumoto at Hiroshima University designed double precision random number generator dSFMT, and reported in the conference MCQMC2008. Together with dSFMT, the C-code has been down-loaded for more than 35000 times. A paper on dSFMT is submitted.

### Achievements in FY2008 (Self Review)

Four international conferences in Japan, international conferences in Canada, Italy, France, (once for each), were organized jointly with other academic funds. For example, 6 young researchers, such as assistant professors and doctor course students, were sent to Monte Carlo and Quasi Monte Carlo 2008 conference in Canada. More than 120 papers related to this program has been written in this academic year. Some of the research results are written in the above "Result of Program Implementation."

### Future Plan

#### Future Plan (Measures toward Achieving Research Objectives)

This program is proceeding well, actually, better than expected.

To achieve the purpose of the program, it would suffice to continue the joint researches and seminar programs, as is planned.

This project is enlarging, new projects such as "user-friendly evaluation of pseudorandom number generators" are started.

Each research Core-Institute has enough academic fund for the program at present.